MATHEWS Open Access Journals

ISSN: 2572-6447

Review Article | Mathews Journal of Diabetes & Obesity

A Review of the Treatment and Prognosis of Diabetic Patients with Different Carbohydrate Content Diets

Xu-tong Zheng, Shan-shan Ma*

Kang Da College of Nanjing Medical University, China.

Corresponding Author: Shan-shan Ma, Kang Da College of Nanjing Medical University, China, **Email:** mssguodong@163.com

Received Date: 01 Oct 2018

Accepted Date: 30 Oct 2018

Published Date: 02 Nov 2018

Citation: Xu-tong Z and Shan-shan M. (2018). A Review of the Treatment and Prognosis of Diabetic Patients with Different Carbohydrate Content Diets. M J Diab. 3(1): 012.

ABSTRACT

Background & Aim: Traditionally, physicians around the world hold the view that carbohydrate intake should be limited in their diet to keep their blood glucose level normal or slightly excessive. However, some update researches, proving that Low Carbohydrate Diet (LCD) with animal-based fat and protein is not necessarily beneficial to the diabetic patient, may revolutionize this opinion prevailing in the world. The purpose of this article is to compare kinds of different viewpoints on diets for DM (diabetes mellitus) people.

Method: We read articles published from the past decade to recently about diet for diabetic patients. By comparing different methods and theories of treatment (traditional and update) in the aspect of diet, we find some associations between LCD and prognosis of the diabetic patient.

Conclusion: Strict limitation of carbohydrate should not be advocated. Since Moderate Carbohydrate Diet is able to reduce the mortality rate, it should be further studied to explore a precious amount of intake of carbohydrate for diabetic patients.

KEYWORDS

Diabetes; Diet; LCD; Moderate Carbohydrate Diet.

INTRODUCTION

Diabetes mellitus (DM) is a group of metabolic disorders with which patients blood glucose level gradually rise, and eventually generates a series of syndromes such as cardiovascular diseases, stroke, CRF(chronic renal failure), DKA(diabetic ketoacidosis) [1,2], and so on. Taking in too much carbohydrate can evidently level up the blood glucose level of the diabetic patients. Weight-loss based on LCD, (LCD is a diet of which 50% of energy derives from fat, 30% of protein and 20% of carbohydrate [14], similarly, some scholars defined it as less than 40% of energy is supplied by carbohydrate [6]) and low protein, low fat was thought to be healthy. Dietary factors were thought to be associated with IR (insulin resistance) too [5]. It's no doubt that limiting the intake of glucose is the main and core belief and prevails the world for decades. High Carbohydrate Diet is not the mainstream and is not widely used, but may inspire us to explore a more suitable diet for DM patients. So, we just introduce a High Carbohydrate Diet briefly.

The emphasis we attach is also on LCD and Moderate Carbohydrate Diet. Many scholars tried to prove the plausibility of the classical theory.

TWO RADICAL VIEWPOINTS

Low Carbohydrate Diet and High Carbohydrate Diet in treating diabetes

Low Carbohydrate Diet

Diets poor in carbohydrate reduced the plasma glucose, and return to normal other biochemical markers such as serum high-density lipoprotein (HDL), cholesterol level, the 2-hour plasma glucose level in the oral glucose tolerance test (OGTT) [1], it also reduce the weight of many patients apparently [6]. This may prove, to some extent, that LCD can improve inflammatory state [7], prolong diabetic patients' life expectancy [5]. However, there are no following investigations to support this

hypothesis. Their study made no attempt to consider the long-term impact that LCD has on DM patients. Also, diets poor in carbohydrate is unable to improve outcome in weight-loss treatment [5], which was proved by one study.

High Carbohydrate Diet

Another scholar, adverse to above, advocate High Carbohydrate Diet (carbohydrate constitutes of more than 70 per cent of daily energy need [6]) to treat diabetes. Previous to 1970s, Patel J C [8] got inspired from vegetarian diabetic patients from India, and food rich in carbohydrate such as wheal (carbohydrate contributed more than 65% of dietary caloric intake) constituted these patients' diet. He advised that carbohydrate should not be restricted in the personalized diet and blood glucose level can easily be managed in a good state [8]. But the experiment he designed was flawed for the reason that the food he supplied to the subjects were mostly vegetables, fruits, cereal, hence his research failed to explore whether the animal-derived protein has an effect on patients. Also, his study has inevitable limitation, which failed to demonstrate the precise relation between the diet he advocated and the prognosis among patients. Vajihe Izadi [7] proved that: a low density-energy diet (carbohydrate contributes to 60% of energy, fat 25%, and protein 15%) with multiple functional foods remarkably eliminate weight regain and reduce the morality caused by CVD. This proportion of carbohydrate is relatively high, but it is obviously beneficial, proving that the source of food is also important. Ole Snorgaard and his team have proved that LCD can only lower blood glucose level just in short term, and in the long term, the glucose-lowering effect of LCD and HCD is predicted to be ambiguously to tell [9]. Traditional carbohydrate-limitation method applied to treat diabetes is, to some degree, not suitable for diabetic patients anymore.

PROSPECTIVE RESEARCH INTO THE EFFECT OF LOW CARBOHYDRATE DIET (LCD) AND MODERATE CARBOHYDRATE DIET FOR DIABETIC PATIENT'S PROGNOSIS

Introduction of Moderate Carbohydrate Diet

Prospective research about the diet of diabetes is radically different from the theory before. By consecutive research, Sara B [4] Seidelmann (2018) finds that both LCD and High Carbohydrate Diet fail to improve the prognosis of diabetic patients. Sara B Seidelmann's research [4] illustrated the "U-shaped relation" between the corelation of the carbohydrate intake and the prognosis in the long term. When individuals live on LCD or HCD, the morality will elevate obviously. That is to say, two kinds of diets above are at two raising segments of the "U shaped chart" respectively. This proves that the diets with moderate level of carbohydrate is the best choice for DM patients.

Further research of Low Carbohydrate Diet: base on plant or animal?

Moreover, Sara B Seidelmann and his team also find that people who live on a Moderate Carbohydrate Diet have lower mortality rates if their protein and fat source are mainly derived from a plant such as cereal and vegetable compared to those who live on a carnivorous diet [4]6. The moderate intake of carbohydrate is proved to be healthy and safe. Diets poor in carbohydrate based on the plant can reduce the state of inflammation in our body and prolong the life expectancy of people [6,10,11]. Also, LCD alone is no avail to flow mediated dilatation (FMD), which is used to evaluate the degree to which endothelial function is impaired [12].Maybe the key problem we should consider is the appropriate proportion of different nutrients(protein, carbohydrate, fat, energy, etc.)

To conclude, LCD, if based on "vegetarian diet", or high in unsaturated fat and low in saturated fat is a superior choice for DM patients [3]. Furthermore, LCD based on "carnivorous diet" can not only worsen the prognosis of diabetic patients but also increase mortality which is caused by CVD [13].The latter disadvantage has been proved by Shanshan Li. However, Sara B Seidelmann's research is merely based on observation, leading to the extent to which the cause corresponds effect remain unclear. Prospective research, though eye-catching, made no attempt to take other variables into consideration.

COMPARISON OF THE IMPACT OF TWO DIETS (LOW CARBOHYDRATE DIET AND MODERATE CARBOHYDRATE DIET) ON DM PEOPLE

Blood glucose or HbA1c

Laura [14], who researched a multitude of groups of participants with all kinds of levels of carbohydrate intake pointed out that LCD can level down blood glucose and HbAlc to some degree. Tae Sasakabe [6] recruited patients who were diagnosed with DM now and previously, afterward he studied systematically some indexes and metabolic measures of these patients such as HbA1c, OGTT, etc. He found that compared with LCD, diets with moderate level of carbohydrate can not only prevent blood glucose from elevating but also betterHbA1c in the long term. Moderate Carbohydrate Diet is superior to LCD in this aspect. Moreover, Dr. Sara B Seidelmann's research [4] with a prominent achievement of "U-shaped relation" has proved that Moderate Carbohydrate Diet is the best choice for DM patients.

Weight

Gary D. Foster [15] studied participants aging 18-65, and he found, in his experiment, that participants live on LCD lost more than 10%(mostly 11%) of their weight compared to their weight a year ago, but they who persisted in LCD could not keep their diets satisfactorily, for that they regain approximately 7% of their weight eventually. Gary D. Foster's research demonstrates that LCD may only have a good effect in the short term, and there will be invalid in long-term management for DM patients. Another researcher [6] drew a conclusion that Moderate Carbohydrate Diet is also favorable to weight-loss. After several months, subjects even change their dietary intake (less carbohydrate, more healthy). This undoubtedly proved the benefit of Moderate Carbohydrate Diet.

Some Metabolic Measures

Metabolic measures of DM is widely used clinically when it comes to diagnosis and evaluation of prognosis of patients. Xiaoling Song's research [16] demonstrates that Moderate Carbohydrate Diet (he defined it as lower fat but rich in carbohydrate) can remarkably improve adiponectin concentrations. Researchers have illustrated that diets with moderate level of carbohydrate can elevate greatly the concentration of HDL in the blood in HDL cholesterol [6], which is thought to be the protective factor against cardiovascular diseases and some hepatic diseases such as fatty liver disease. Laura R [14] pointed out the connection and difference of Metabolic Measures between them: the decline of LDL of participants based on LCD is slower and slighter than those who are based on Moderate Carbohydrate Diet. This study may prove the obvious benefit of Moderate Carbohydrate Diet for diabetic patients. Moreover, SAT (subcutaneous adipose tissue) of men and women decreased significantly when living on a Moderate Carbohydrate Diet [6].

CONTROL AND MANAGEMENT OF DM PEOPLE: THERE ARE NO SINGLE VARIABLES

As is pointed out in the study, individuals who are overweight, if urged to training regularly, may have almost the same effect on cognitive performance, no matter what diet (Low carbohydrate and High carbohydrate) he is having [9]. This may highlight that the cognitive factors are crucial in the managing DM patients [14, 15]. Also, the article inspires us that more variables should be considered to validate the conclusion for the reason that the prognosis and biochemical markers are susceptible to various factors such as gene [14], cognitive factors, age, etc.

DISCUSSION

Matters related to limitation of carbohydrate cannot be taken for granted. Excessive carbohydrate or low carbohydrate is both unfavorable to DM patients. New methods are desperately needed. By comparing the method of diet for DM patients, we may find a better way to better the living quality of patients so as to prolong their life expectancy. A new diet called Paleolithic Diet may inspire us, maybe moderate carbohydrate, moderate protein [7, 17-26], which is consistent with Dr. Sara B Seidelmann's opinion, is able to explore a balance in how much carbohydrate is suitable for diabetic patients.

CONCLUSION

Strict limitation of carbohydrate should not be advocated. Since Moderate Carbohydrate Diet is able to reduce the mortality rate, it should be further studied to explore a precious intake of carbohydrate for diabetic patients.

REFERENCES

1. Dehghan M, Mente A, Zhang X, Swaminathanet S, et al. (2017). Associations of fats and carbohydrate intake with cardiovascular disease and mortality in 18 countries from five continents (PURE): a prospective cohort study[J]. The Lancet. 390(10107): 2050-2062.
2. Maekawa S, Kawahara T, Nomura R, Murase T, et al. (2014). Retrospective study on the efficacy of a low-carbohydrate diet for impaired glucose tolerance [J]. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy.195-201.
3. Tay J, Luscombemarsh ND, Thompson CH, Noakes M, et al. (2015). Comparison of low- and high-carbohydrate diets for type 2 diabetes management: a randomized trial [J]. The American Journal of Clinical Nutrition. 102(4): 780-790.
4. Maekawa S, Kawahara T, Nomura R, Murase T, et al. (2014). Retrospective study on the efficacy of a low-carbohydrate diet for impaired glucose tolerance [J]. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy. 195-201.
5. Cheryl L. Rocka, Shirley W. Flatta, Bilge Pakiza, Elizabeth L. Quintanaa, Dennis D. Heatha , Brinda K. Ranab, and Loki Natarajana. Effects of diet composition on weight loss, metabolic factors and biomarkers in a 1-year weight loss intervention in obese women examined by baseline insulin resistance status [J].Metabolism. 2016 November; 65(11): 16051613. doi:10.1016/j.metabol.2016.07.008.
6. Sasakabea T, Haimotob H, Umegakic H, Kenji Wakaia, et al. (2015). Association of decrease in carbohydrate intake with reduction in abdominal fat during 3-month moderate low-carbohydrate diet among non-obese Japanese patients with type2 diabetes [J].Metabolism. 64(5): 618-

625.

7. Burns SF and Miyashita M. (2015). Effects of Low-Carbohydrate and Low-Fat Diets [J]. Annals of Internal Medicine. 162(5): 392-393.
8. Patel JC, Metha AB, Dhirawani K, Juthani VJ, et al. (1969). High carbohydrate diet in the treatment of diabetes mellitus. [J] Diabetologia. 5(4): 243-247.
9. Snorgaard O, Poulsen GM, Andersen HK, Astrup A, et al. (2017). Systematic review and meta-analysis of dietary carbohydrate restriction in patients with type 2 diabetes [J]. BMJ open diabetes research & care. 5(1).
10. Hu T, Yao L, Reynolds K, Whelton, et al. (2015). The Effects of a Low-Carbohydrate Diet vs. a Low-Fat Diet on Novel Cardiovascular Risk Factors: A Randomized Controlled Trial [J]. Nutrients. 7(9): 7978-7994.
11. Wycherley TP, Thompson CH, Buckley JD, Luscombe-Marsh ND, et al. (2016). Long-term effects of weight loss with a very-low carbohydrate, low saturated fat diet on flow mediated dilatation in patients with type 2 diabetes: A Randomised controlled trial [J]. Atherosclerosis. 28-31.
12. Li S, Flint AJ, Pai JK, Forman JP, et al. (2014). Low Carbohydrate Diet From Plant or Animal Sources and Mortality Among Myocardial Infarction Survivors [J]. Journal of the American Heart Association. 3(5).
13. Saslow LR, Kim S, Daubenmier J, Moskowitz JT, et al. (2014). A Randomized Pilot Trial of a Moderate Carbohydrate Diet Compared to a Very Low Carbohydrate Diet in Overweight or Obese Individuals with Type 2 Diabetes Mellitus or Prediabetes [J]. PLOS ONE. 9(4).
14. Foster GD, Wyatt HR, Hill JO, Samuel Klein, et al. (2010). Weight and Metabolic Outcomes After 2 Years on a Low-Carbohydrate Versus Low-Fat Diet: [J]. Obstetrical & Gynecological Survey. 65(12): 769-770.
15. Song X, Kestin M, Schwarz Y, Yang P, et al. (2016). A low-fat high-carbohydrate diet reduces plasma total adiponectin concentrations compared to a moderate-fat diet with no impact on biomarkers of systemic inflammation in a randomized controlled feeding study [J]. European Journal of Nutrition. 55(1): 237-246.
16. Burns SF and Miyashita M. (2015). Effects of Low-Carbohydrate and Low-Fat Diets [J]. Annals of Internal Medicine. 162(5): 392-393.
17. Jonasson L, Guldbrand H, Lundberg A, Nystrom FH, et al. (2014). Advice to follow a low-carbohydrate diet has a favourable impact on low-grade inflammation in type 2 diabetes compared with advice to follow a low-fat diet [J]. Annals of Medicine. 46(3): 182-187.
18. Guldbrand H, Lindstrom T, Dizdar B, Bunjaku B, et al. (2014). Randomization to a low-carbohydrate diet advice improves health related quality of life compared with a low-fat diet at similar weight-loss in Type 2 diabetes mellitus [J]. Diabetes Research and Clinical Practice. 106(2): 221-227.
19. Sara B Seidelmann, Brian Claggett, Susan Cheng, Mir Henglin, et al. (2018). Dietary carbohydrate intake and mortality: a prospective cohort study and meta-analysis [J]. Lancet Public Health. 3(9): e419-e428.
20. Gardner CD, Offringa LC, Jennifer H, Kapphahn K, et al. (2016). Weight Loss on Low-Fat vs. Low-Carb Diets by Insulin Resistance Status Among Overweight Adults & Adults with Obesity: A Randomized Pilot Trial. Obesity (Silver Spring). 24(1): 79-86.
21. Wing RR, Blair EH, Marcus MD, Epstein LH, et al. (1994). Year-long weight loss treatment for obese patients with type II diabetes: Does including an intermittent very-low-calorie diet improve outcome? [J]. The American Journal of Medicine. 97(4): 354-362.
22. Izadi V, Haghighatdoost F, Moosavian P, Azadbakht L. et al. (2018). Effect of Low-Energy-Dense Diet Rich in Multiple Functional Foods on Weight-Loss Maintenance, Inflammation, and Cardiovascular Risk Factors: A Randomized Controlled Trial [J]. Journal of the American College of Nutrition. 37(5): 399-405.
23. Klonoff DC. (2009).The Beneficial Effects of a Paleolithic Diet on Type 2 Diabetes and Other Risk Factors for Cardiovascular Disease [J]. Journal of diabetes science and technology. 3(6): 1229-1232.
24. Brinkworth GD, Wycherley TP, Noakes M, Buckley JD, et al. (2016). Long-term effects of a very-low-carbohydrate weight-loss diet and an isocaloric low-fat diet on bone health in obese adults [J]. Nutrition. 32(9): 1033-1036.
25. Tay J, Zajac I, Thompson CH, Danthiir V, et al. (2016). A randomised-controlled trial of the effects of very low-carbohydrate and high-carbohydrate diets on cognitive performance in patients with type 2 diabetes [J]. British Journal of Nutrition. 116(10): 1745-1753.
26. Li S, Flint A, Pai JK, Forman JP, et al. (2014). Low Carbohydrate Diet from Plant or Animal Sources and Mortality Among Myocardial Infarction Survivors [J]. Journal of the American Heart Association: Cardiovascular and Cerebrovascular Disease 3(5): e001169.